CHAPTER 4

UNDERGROUND STORAGE TANK (UST) INVESTIGATIVE REQUIREMENTS

4-1. General. This chapter discusses data gathering and investigative techniques to determine where the tank is located and what has been in the tank.

4-2. Tank History/Information. Prior to a UST removal, a history of the tank characteristics should be assembled by the designer. It should be as detailed as possible from readily available sources such as records, reports, and interviews. Data gathering is important because the more information a designer has prior to construction, the less surprises will be encountered during removal. Items of specific interest and associated tasks include:

a. Existing Drawings. Review engineering drawings, preferably as-builts, and interview the site personnel. Determine, if possible, the tank and associated piping location, the dimensions and capacity of the tank, material of construction, depth, corrosion protection systems, presence or absence of ballast pads and tie downs, age, and date tank was last used. In some instances, this information may be on an installation's utility maps. If existing drawings cannot be obtained, refer to later parts of this chapter for investigative procedures to obtain tank information.

b. Inventory Control Records. Review inventory control records as a source of information to determine the types of liquids stored in the tank and whether the tank system has leaked.

c. Interviews. Determine from site personnel the location, magnitude, and duration of any environmental releases associated with the UST. Determine how the liquids were placed into and removed from the tank, monitoring procedures followed, and the types of liquids stored in the tank. Determine if abandoned tanks were filled with sand, water or concrete at the time of abandonment. A list of previous employees who may have worked in the area should be obtained from the installation to facilitate this process.

d. Utilities. Locate all underground utilities including, but not limited to, sanitary sewers, storm sewers, water lines, gas lines, power lines, telephone lines, and all associated piping and appurtenances associated with the area immediately surrounding the tank.

e. Site Characteristics. Determine depth, rate, and direction of groundwater and soil characteristics from record searches if possible. This information is not required for all removals, but it is helpful information for the designer. If data is not available and it is determined to be necessary for tank removal, refer to Chapter 5 for investigative procedures.

4-3. Regulatory Issues. Federal, state, and local agencies will need to be contacted well in advance of tank removal (a minimum of 30 days). Preferably, the Environmental Coordinator should contact the applicable agencies. In many cases the regulatory agency may want to have an individual onsite to observe tank removal. Appendix B lists state agencies in charge of UST management. In addition, state regulatory agencies can supply lists of licensed tank removal/disposal firms and provide guidance for waste disposal and other useful information. Tanks storing hazardous waste are regulated under 40 CFR 264/265 and are outside the scope of this document.

4-4. Tank Locations.

a. As-Built Drawings. One source of information for locating USTs is the construction drawings used to install the tank. In some instances, this information may be on an installation's utility maps. Once the drawings have been obtained, they should be field-verified by the designer, if possible, to determine whether the tank is in the location specified. You should recognize it may be difficult to verify as-built drawings.

b. Visual Inspection. You may be able to locate tanks by visually locating manholes, variations in concrete or asphalt, vent pipes, fill pipes, and ground depression or elevation. In some instances visual inspection by itself is not reliable. Insert a steel probe into the ground to assist the visual inspection.

c. Geophysical Methods. In cases where documentation of tank locations is questionable or nonexistent, the application of surface geophysical methods has been a successful means of delineating approximate tank boundaries. These methods can provide information that would be otherwise unavailable without costly, and often dangerous, ground-intrusive activity. In addition, the same types of geophysical data used to identify tank burials can often supply useful information concerning local hydrogeologic conditions, and in some instances, the extent of any gross contamination associated with an UST system. The success of any single geophysical technique at a given site is dependent on site-specific conditions. Therefore, it is generally recommended that you apply more than one geophysical technique to any single objective to accommodate situations where the data from a particular method are deemed problematic. In such a situation, the questionable data can often be quite useful when they are used as a supplement to more definitive data.

Carefully review all pertinent background information and conduct a site visit before designing any geophysical survey to make prudent selections of techniques and to optimize the efficiency of the survey. Several methods are discussed below and presented in Table 4-1. For more detailed information, the reader should consult EM 1110-1-1802 and ASTM PS78. Also the reader may refer to EPA/625/R-92/007.

(1) Magnetometer Surveys. One of the most commonly used techniques is magnetometry. Ferromagnetic objects, such as a steel tank, produce variations, or anomalies, in the earth's magnetic field. These aberrations are localized and can be mapped at the surface using one of a variety of magnetometers. Magnetometer surveys are relatively easy to implement, but interpretation of magnetic data alone is not always straightforward. Ferromagnetic objects at the surface (e.g., buildings, fences, automobiles) will produce anomalies that may alter or mask anomalies caused by ferromagnetic items beneath the ground. In addition, the position of magnetic anomalies at the surface does not necessarily mimic the position of their underground sources.

(2) Terrain Conductivity. Terrain conductivity is a function of the type of subsurface material, its porosity, permeability, and the fluids that fill the pore space. Accordingly, this electromagnetic (EM) technique is applicable to assessment of some natural hydrogeologic conditions as well as to mapping contaminant plumes, trench boundaries and, of course, identifying buried tanks. Similar to magnetic field surveys, conductivity surveys are relatively fast and easy to perform. The conductivity data are also susceptible to the same surficial "interferences" (caused by cultural features) that can plague

TABLE 4-1
GEOPHYSICAL METHODS

Method	Depth of Penetration	Resolution	Advantages	Disadvantages
Magnetometer (MAG)	Single 55-gallon drum, up to 6 meters. Massive piles 55-gallon drums, up to 20 meters.	Good ability to locate targets.	Quick, one-man operation. Can readily detect buried ferrous objects (buried drums or pipe lines).	Large masses of ferrous objects can have broad response preventing precise location of individual targets. Susceptible to interference from surface metallic objects such as fences. Will not detect materials with low magnetic susceptibility (i.e., nonferrous objects such as fiber tanks).
Terrain Conductivity	Depth controlled by system coil spacing 0.5 to 60 meters typical.	Excellent lateral resolution. Vertical resolution of two layers. Thin layers may not be detected.	No electrodes required–can be used on surfaces where electrode plants would be impossible. Very fast and efficient. One or two man crew. Can be conducted through fresh water. Two-coil orientations and several intercoil separations available to allow several depths of investigation.	Depth inversion ability very limited. Relatively insensitive to changes in conductivity in highly resistive targets. Highly conductive surface materials limits depth of penetration.
Ground Penetrating Radar (GPR)	One to ten meters typical–highly site- specific. Limited by fluids and soils with high electrical conductivity and by fine-grained materials.	Greatest of all three geophysical methods.	Resolution can be on the order of a few centimeters. Provides a cross-section of subsurface. Can detect buried drums–ferrous or nonferrous. Can detect variations in soil type or moisture. Can detect disturbed soil zones. Can detect water table.	Equipment is cumbersome–usually requires flat surface. Depth of penetration seriously limited by conductive material such as clay or water. Decreasing transmitter frequency to increase penetration decreases resolution.

magnetometer data. However, conductivity meters generally provide much better lateral resolution over a buried target. Further, effective penetration depths and sensitivity (to metal) can be adjusted according to the objectives of the survey. Shallow terrain conductivity data can provide lateral resolution on the order of a few feet, which is usually sufficient for most tank removals.

(3) Ground Penetrating Radar (GPR). If site conditions preclude the use of magnetic and electromagnetic techniques, ground penetrating radar (GPR) is also a viable, though more expensive, means of identifying buried tanks. In fact, GPR can often provide lateral resolution on the order of a foot or less and thus minimize costly excavation. The GPR technique uses high frequency radio waves to acquire subsurface information. From a small transmitter antenna which is moved slowly across the ground, energy is radiated downward below the surface, then reflected back to a receiver antenna. Variations in the return signal are continuously recorded in the instrument's console, providing a continuous "cross-section" of shallow subsurface conditions. An interface between materials having significantly different electrical properties will be apparent on the radar profile. Buried tanks and other discrete objects can be identified providing they are of sufficient size to overcome the inverse relationship between resolution and depth penetration. The depth of penetration with GPR is highly site-specific and is limited by subsurface attenuation of the radar waves; this attenuation is accelerated in materials that have higher electrical conductivities. Generally, better penetration is achieved in dry, sandy, or rocky areas while poor results are obtained in moist, clayey, or conductive soils.

4-5. Site Reconnaissance. During efforts to locate the tank, the following items should also be noted by the designer:

a. Cover. Identify whether the tank is covered by grass, concrete, asphalt, etc. If possible, determine thickness of cover by reviewing as-built drawings or inserting a steel rod through the soil. This information will be used in preparation of excavation requirements.

b. Building Proximity. Note where the tank is located with respect to buildings. If the tank is located too close to a building to remove safely, the option to close the tank in place must be evaluated. A tank should be far enough away from buildings to allow the excavation to be safely completed within the excavation criteria specified in

Chapter 7. Note whether any subsurface structures, such as basements, sewers, and other utilities are present where vapors can collect.

c. Evidence of Leakage or Spillage. Visually inspect the area above and surrounding the tank. Note whether there is any surface contamination indicated by dark soil or stressed vegetation. Evidence of leakage can sometimes be found in sanitary and storm water manholes near USTs, in basement sumps, and in nearby surface waters or groundwater seeps or springs.

d. Utilities. Verify the utility drawings or obtain verification from the utility as to the exact location of underground or overhead utilities. Note any deviations from the drawings. Evaluate any effects of utility location on construction activities.

4-6. Tank Contents Sampling. The determination of the chemical composition of the tank contents and an estimate of the volume of these contents is crucial in the decision-making process to be performed by the USACE. This task may be performed by USACE or a contractor. The objective of tank sampling is to characterize tank contents and to separately identify those tanks that contain only fuel oils, petroleum products, or related materials from those that contain PCBs, contaminated oils, solvents, or other hazardous waste constituents as defined in 40 CFR 260.10 and listed in 40 CFR 261 Appendix VIII.

If hazardous substances are found during design or predesign activities, ensure adequate lead-time to plan appropriate construction activities. Also, the USACE may recommend limiting subsequent chemical investigations at this site to include only those analytes found in the UST. The results of these analyses can also simply be used to determine the proper method of disposal, including recycling for beneficial use. Many USACE Districts utilize Indefinite Delivery/Indefinite Quantity (ID/IQ) UST Removal Contracts, which include the sampling as a part of the removal process. These contracts make assumptions based on information provided by the USACE District in a scope of work and a site visit conducted jointly by the contractor and the USACE. Refer to paragraph 4-2 regarding site investigative activities.

a. Typical properties exhibited by petroleum products are discussed below. Petroleum products can be divided into the following general groups:

- Gasolines.
- Middle distillates.
- Heavier fuel oils and lubricating oils.

(1) Gasolines are blends of petroleum-derived chemicals plus additives that improve fuel performance and engine longevity. Gasolines range in density from 0.72 to 0.78 g/cm^3 and are less viscous than water. Gasoline is immiscible in water; however, there are many components of gasoline that readily dissolve upon contact with water.

(2) The middle distillate group includes diesel fuel, kerosene, jet fuel, and lighter fuel oils. These fuels may contain as many as 500 individual compounds; however, these compounds tend to be more dense, less volatile, less mobile, and less water soluble than gasoline materials.

(3) Heavier fuel oils are similar in composition and characteristics to the middle distillates. These types of fuels are relatively viscous and insoluble in groundwater and are relatively immobile in the subsurface. See Table 4-2 for properties of six common petroleum products.

b. High Concentration Hazard. Until the identity of UST contents is known, all UST contents should be classified and treated as high-concentration waste for purposes of sample handling.

c. Overview. As a general guideline, the volume of liquid and sludge content in the UST should be estimated before any sampling is done. The USACE Contracting Officer's Representative (COR) can make a decision regarding sampling once these quantities are known. The USACE may have the option (depending on state and local regulations) not to sample a layer and treat the entire layer as hazardous waste. If this option is not exercised, the following sampling plan should be employed.

(1) Only one liquid layer present: Collect subsamples at two depths: near the surface (20 percent depth) and near the bottom (80 percent depth). These two subsamples should be composited to form a single sample for analysis.

(2) Two liquid layers present: Sample each liquid layer and treat as a separate sample.

(3) Empty tanks: Do not sample tanks found to be free of any liquid phase. If there is reason to believe that an empty tank may have held chemicals other than petroleum, oils, and lubricants (POLs), consult the Center of Expertise (HTRW-CX)for guidance.

TABLE 4-2
PHYSICOCHEMICAL PROPERTIES OF SIX COMMON HYDROCARBON MIXTURES

Product	Liquid Density (g/cm^3)	Liquid Viscosity (cPoise)	Water solubility (mg/L)	Vapor Pressure (mm Hg)	Vapor Density (g/m^3)	Flashpoint (°C)
Automotive Gasoline	(0.73) 0.72-0.76 [15.6]	(0.45) 0.36-0.49 [15.6]	(158) 131-185 [13-25]	(469) 263-675 [38]	1,950	<2
No. 2 Fuel Oil	(0.91) 0.81-0.92 [15]	(1.56) 1.15-1.97 [21]	3.2	(14.3) 2.12-26.4 [21]	109	>38
No. 6 Fuel Oil	(0.96) 0.93-1.06 [15]	(254) 14.5-493.5 [38]	~5	(14.3) 2.12-26.4 [21]	105	>38
Jet Fuel (JP-4)	0.75	0.829 [21]	<300	91	400	-23
Jet Fuel (JP-8)	0.80	1.98	Negligible	50	N/A	46
Mineral Base Crankcase Oil	0.84-0.96 [15]	275 [38]	Negligible	N/A	N/A	>38

N/A = Not Available
Note: All values are approximate. Tank contents may be mixtures with varying characteristics.
Note: Values for 20°C unless otherwise indicated. Brackets [ ] indicate a different temperature in °C.
Note: Values in parentheses are typical of the parameter.
Note: Density of fuel vapors is greater than air so vapors will tend to collect in low places.
Source: Compiled from various published and unpublished sources.

d. Strategy for the Analysis of UST Contents. There are only a few categories of liquids likely to be present in underground storage tanks at most sites: (1) fuel oil/diesel (2) gasoline (3) jet fuel (4) kerosene (5) heating oil (6) oily water (7) chlorinated solvents (8) waste oil (9) herbicides and/or pesticide/PCBs, (10) paint and plating waste/byproducts, and (11) used oil. Sampling strategy will vary depending upon the type of material stored and whether the material is intended for recycle or disposal. Commercial chemicals and fuel products recovered from an UST used for product storage that are still suitable for use can still be used for their intended purpose. They do not have to be disposed of as hazardous waste. For these types of materials, analysis will be confirmatory in nature to determine the product identity and purity. However, fuel water mixtures that must be processed in order to be usable, materials that can not be used for their intended purpose, waste oils, used oils, and spent materials will require analysis to characterize them for recycle or disposal.

(1) The analyses outlined here are intended to obtain enough information to adequately identify the tank contents for proper recycle/disposal in accordance with applicable federal and state regulations. The analyses should help determine whether the fluid in an UST is a useable product, is expected to become a hazardous waste when removed for disposal, or is just oily water that may be discharged to a nearby publicly owned treatment works (POTW) or an oil-water separator.

(2) For used oily wastes, the sampling strategy begins with consideration of EPA’s Standards for the Management of Used Oil, 40 CFR 279. To ensure oily waste is not subject to hazardous waste regulation, sample for total halogens. If the result is less than 1,000 mg/L halogens, then additonal testing would be limited to parameters listed in Table 4-3. If more than 1,000 mg/L total halogens are detected, the oily waste is presumed to be hazardous waste unless demonstrated otherwise. To pursue a non-hazardous waste demonstration, Methods 8021 or 8260 may be utilized to determine whether signficant amounts of halogenated hazardous constituents from Appendix VIII of 40 CFR 261 are present.

The basis for this testing is found in used oil standards in 40 CFR 279. According to these standards, if oily waste contains greater than 1,000 mg/L total halogens, it is presumed that listed hazardous waste was mixed into the oil. The resultant mixture is then regulated as hazardous waste unless it can be demonstrated that the source of the halogens was not hazardous waste. Once the hazardous waste presumption is rebutted, use Table 4-3 to determine whether the oil is on-specification or off-specification. As can be seen from Table 4-3, used oil can contain up to 4,000 mg/L total halogens and still be considered on-specifiction used oil provided the hazardous waste presumption has successfully been rebutted.

TABLE 4-3
USED OIL SPECIFICATION

Constituent/Property	Final Rule Allowable Level
Arsenic	5 ppm maximum
Cadmium	2 ppm maximum
Chromium	10 ppm maximum
Lead	100 ppm maximum
Total Organic Halogens	1,000 ppm rebuttable 4,000 ppm maximum
Flashpoint	100 degree F minimum

On-specification used oil can be burned in any type of burner. Off-specification used oil, on the other hand, is restricted to being burned in devices listed in 40 CFR 279.61. This limits burning to industrial boilers; industrial furnaces; utility boilers used to produce electric power, steam, heated or cooled air, or other gases or fluids for sale; on-site space heaters meeting the criteria of 40 CFR 279.23; and hazardous waste incinerators.

The used oil specification in Table 4-3, however, only applies to used oil. It does not apply to fuel products. For fuel products the sampling strategy will be based primarily on the requirements of the fuel purchaser/user. Additionally, testing may be required to determine the Department of Transportation (DOT) Proper shipping name for the fuel if sufficient knowledge of the material is not available. Generally, testing for flashpoints and boiling points of petroleum products will be sufficient to determine applicable DOT shipping requirements.

For materials that are not petroleum fuels or used oils such as waste waters, paint wastes, pesticides, PCBs, etc., the sampling strategy will be to analyze the material to determine whether there are viable recycling and/or energy recovery options and to determine whether the material is subject to regulation under the Resource Conservation and Recovery Act (RCRA) or the Toxic Substances Control Act (TSCA).

e. Required Analyses.

(1) Analysis for used oil: Analyze each UST organic liquid sample collected for total arsenic, total cadmium, total chromium, total lead, total organic halogens, and flashpoint. Currently, no EPA method correctly analyzes organolead in a liquid organic matrix. The organic layer is not usually analyzed for total recoverable petroleum hydrocarbons (TRPH) since it is usually 100 percent hydrocarbon (unless required by applicable regulations). Analysis to determine fuel type is more appropriate.

(2) Analysis for petroleum products: Characterization tests may be provided by the receiving facility in accordance with state and local regulations. Some facilities perform the work at the receiving facility. Others require characterization tests prior to shipment. The ignitability test requires only 2 mL of sample. Ship samples as high concentration wastes. Adhere to the USACE *Sample Handling Protocol* in EM 200-1-3, Appendix F explicitly.

(3) Analysis for non-petroleum wastes such as waste waters, PCBs, etc.: (NOTE: the scope of this EM does not include hazardous waste tanks; however, hazardous wastes may be encountered incidental to other activities such as when water intrudes into a gasoline product tank. Therefore, this section is intended to address these types of wastes.) Aqueous layers in the tank may be sampled for TRPH; RCRA characteristics including pH, flashpoint, and TCLP constituents reasonably expected to be present such as lead (or RCRA metals); PCBs; and volatile organic compound analytes. VOC analysis requirements are specified in 40 CFR 265.1084. If both organic and aqueous phases are present, the USACE may elect to analyze each phase for certain parameters selected from the complete list to minimize redundancy. The laboratory used for these analyses should be validated to ensure that it is capable of performing these analyses correctly.

(4) Analysis for compliance with DOT requirements: Unless the material is a known product, analysis will typically include pH, flashpoint, and boiling point.

f. Tank Accessibility.

(1) Underground storage tanks may not always be easily accessible for testing during preconstruction activities. Tanks and their filler caps may have been paved over or may be under debris. The contractor for sample collection must consult with the Contracting Officer’s Representative (COR) before removing soil or debris to gain access to an UST. In cases where UST accessibility is not possible, tank sampling may be deferred until the construction phase. The construction contractor will facilitate access to the tank by removing debris and dirt so that a sampling subcontractor may collect samples during the construction phase. You should recognize that if tank sampling is deferred until construction due to limited accessibility, the lack of information can lead to costly problems if surprises are encountered. These problems may include contractor downtime, contract modifications, and unexpected increases in disposal/treatment costs. The tank should not be moved until the tank contents can be characterized.

(2) Situations will arise in which UST access is not possible even though the fill pipe is accessible. This may be the result of corrosion. In this event, the field sampling supervisor should contact the project manager for guidance.

g. UST Contents Sampling Instructions. These instructions provide a reasonable method for sampling USTs and may be modified or replaced with equivalent instructions to allow for site-specific constraints. Sampling devices must be explosion proof. Acceptable sampling devices include: peristaltic pumps, bladder pumps, weighted bottles, Kemmerer samplers, bailers, or COLIWASAs (for small tanks). See EM 200-1-3 for guidance on sampling methods or refer to EPA/540/P-91/005 *Compendium of ERT Surface Water and Sediment Sampling Procedures*, EPA/540/P-91/008 *Compendium of ERT Waste Sampling Procedures*, and EPA/600/2-80/018 *Samplers and Sampling Procedures for Hazardous Waste Streams* for additional information on these type of samplers. The peristaltic pump provides the most convenient method of withdrawing a sample from a tank and makes it easy to sample separate phases. Instructions for sampling liquid layers in a tank are:

(1) Wear personal protective equipment as specified in the Site Safety and Health Plan.

(2) Remove the fill pipe cap with use of nonsparking tools.

(3) Determine depth of tank and depth of tank contents: Lower a wooden stick (1" by 1" by 12') coated with water-indicating paste (e.g., Kolor Kut™) to the bottom of the tank. Record the following:

- Distance from the bottom of the tank to the soil surface.
- Total depth of the sludge layer (if this can be determined by inspection of the stick).
- Total depth of each layer of liquid in the tank.
- Whether each layer is aqueous or nonaqueous. (Chlorinated solvents are more dense than water; oil, gasoline, etc. are less dense than water.) If the water is on top, the water-indicating paste will **not** indicate the presence of the heavier-than-water organic layer.

(4) Collect each separate stratified liquid and/or solid phase for chemical analysis.

(5) To collect a sample using a peristaltic pump:

- Fasten the tubing to the stick (used for measuring the depth of the product) at the point from which the sample is to be withdrawn.
- Extend the stick into the tank until it reaches the bottom.
- Operate the pump to withdraw the sample directly into the sample bottle.
- Adjust the stick to withdraw a sample from another depth.
- Other methods of sample collection are detailed below.

(a) Weighted Bottle. Carefully remove cork with a short, sharp tug on the chain. Allow adequate time for the bottle to fill. Additional guidance may be found in ASTM Standards D 4057 and E 300.

(b) Kemmerer Sampler. Seat the valve at the base of the sampler. Lower the sampler into the tank. Unseat the valve at the desired depth. Additional guidance may be found in EPA/540/P-91/005 (SOP #2013) and ASTM Standard D 4136.

(6) Remove the sampling device from the UST.

(7) Transfer the contents into the sample containers. Preserve as appropriate. If only organic phase is being sampled, no preservation or cooling is required. Samples must be packed and shipped as high-level samples.

(8) Fasten the covers finger tight.

(9) Fill out field notebook, sample log sheet, labels, and chain-of-custody forms (See Chapter 8 for details).

(10) Place in cooler at 4 degrees C. (Follow Chapter 8 for packaging requirements, use of cans for high-hazard wastes, etc.)

(11) Decontaminate sampling equipment as described in Chapter 9 of this manual.

h. Sludge Sampling.

(1) Sludge may be present at the bottom of the UST. Since storage of RCRA-regulated waste is limited to 90 days without a permit, it is important to characterize it early. If generator knowledge is lacking, sludge analysis should include flashpoint to determine if it meets the RCRA definition for the characteristic of ignitability and should include TCLP analyses for metals or other suspected TCLP constituents. Generally, perform sludge sampling if:

(a) The tank contains no liquid or the liquids have been removed.

(b) The tank is being removed and disassembled, and disposal regulations for the sludge require sampling/analysis.

(c) Federal, state, and local regulations require sludge analysis.

(2) Instructions for sampling sludge:

(a) Wear personal protective equipment as required in the Site Safety and Health Plan.

(b) Use an appropriate nonsparking sampling device such as a polyethylene dipper (ASTM D 5358)or teflon COLIWASA (ASTM D 5495).

(c) Immediately transfer sludge from the sampling device to fill the pair(s) of bottles required for VOAs. Fill as completely as possible. Fasten the cover finger tight.

(d) Transfer the remainder of the sample into a stainless steel mixing bowl. A stainless steel spoon or trowel may be used to assist in this step.

(e) Repeat Steps (b) and (d) to obtain the required volume of sludge. Refer to the Quality Control (QC) requirements in Chapter 8. (For some samples it will be necessary to obtain at least 48 oz. of sludge.)

(f) Quickly remove all nonsludge materials including stones and vegetation from the mixing bowl.

(g) Composite (homogenize) the bowl contents with a stainless steel spoon.

(h) Fill the 8-oz. wide-mouth glass bottles at least 3/4 full.

(i) Fasten the cover finger tight.

(j) Fill out field notebook, sample log sheet, labels, and chain-of-custody forms.

(k) Place in cooler at 4 degrees C.

(l) Decontaminate sampling equipment as described in Chapter 9.

(3) QC split/duplicate samples. Refer to Chapter 8 for split sample requirements.